# NEW METHOD OF THE DIMINUTION POLLUTION EMISSION FROM THE THERMIC ENGINES

**Chioreanu Nicolae** *

**University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail: nchioreanu@uoradea.ro*

***Abstract***

*The paper describes a new method about the diminution of polluting emissions of the internal combustion engines. The method consists into designing motors which can run in one raided running. The debate analyses the base conditions necessary to be completed by the engines machines, in order to work according to the new concept. The engine machines which can realize the conditions of the new concept are the engines with free piston hydrostatic generators.*

**Key words:** *Polluting emissions, thermic engine, internal combustion engine, engine with free piston.*

## INTRODUCTION

The pollution of the environment represents a range of detrimental changes, caused by the emission of polluting substances in the atmosphere. The polluting substances have a negative effect upon the health of people, animals and biological ecosystems.

The gases evacuated in the atmosphere by internal combustion engines represent a main source of pollution. Internal combustion engine emit mainly nitrogen oxides $\mathbf{NO_2}$, sulphur oxides $\mathbf{SO_X}$, carbon monoxides **CO**, carbon dioxides $\mathbf{CO_2}$, solid particles (smoke or soot), etc. At the same time, some of the emissions from the evacuated gases react in the atmosphere, forming the photo-chemical smog. The carbon dioxide $\mathbf{CO_2}$, a non-toxic gas (3-4 %), a natural component of the atmosphere, is considered to be a polluting substance, because produces the greenhouse effect.

The negative effects of polluting emissions of the internal combustion engines, called for actions for restricting these emissions. The main actions of polluting emissions refer to research in order to find solutions of designing less polluting and more economical engines, from the fuel consumption point of view. The main achievements are: the control of burning through electronic devices and gasoline injection for the spark engines, and the electronic control of fuel injection for the compression engines. The electronic devices for control of the burning are complex systems. Their complexity arises from the fact that the working conditions of the existing engines vary continuously. From here, *the concept of designing engines which work in mono-running only*, independently from the working conditions of the parts they have effect on. The engine which works in mono-running only is a more simple system and easier to control. The running conditions can be optimized more easily, in order to result an engine which emits less pollution and has lower fuel consumption. The control systems of the thermodynamic processes become simpler.

## NEW METHOD

The basic element of the propulsion systems is the engine, which has the role of changing the thermo energy, achieved by burning of a fuel, into mechanic energy, generally as a rotary motion. The transmission of the mechanic energy to the working parts (the wheels of the car, etc.) is usually made through mechanic or hydraulic transmission, *in a*

*direct way*. In order to realize a stable engine running, it is necessary that the energy flow transmitted by the engine be equal to the energy consumed by the working parts of the system. But, because usually the energy consumed by the working parts of the system varies, the result is that the energy flow of the engine must be varied. This is the reason why the present engines have devices for varying the energy flow, called regulators. The greater the energy flow from the propulsion system, the harder the engine runs, having negative consequences on energy consumption and durability.

In order to eliminate these disadvantages, *the author suggests a new concept regarding engine designing,* [1]. The concept presumes to work out engines made mainly of an energy generator, energy accumulator and engine machine, in which two kind of energy transformation take place, a primary one and a secondary one. The primary one is realized by the energy generator, which transforms the input energy in another form of energy (different from mechanic energy) and transmits it to the accumulator. The secondary one is realized by the engine machine, which takes over the energy from the accumulator and transforms it into mechanic energy, generally as a rotary motion. The way the engine works is the following **(fig. 1)**: the energy generator **(GE)** transforms the input energy (thermic) in another form of energy (hydrostatic, pneumatic) and providing the produced energy for the energy accumulator **(AE)** until the amount of energy in the accumulator reaches the maximum. At that moment, the generator **(GE)** automatically stops working, until the energy from the accumulator drops to the minimum admitted amount. In this way, the generator **(GE)** works automatically, in one running, obviously in the most advantageous way, independently from the engine machine **(MM)**. When the generator has the cycle formed by resistant strokes (compression, evacuation, etc.) the course of energy flow may be both way, generator-accumulator and accumulator-generator. The machine **(MM)** takes over the energy from the accumulator and transforms it in mechanical energy, depending on the consumption realized by the working parts of the system. The course of energy flow may be both way, accumulator-engine machine, and engine machine-accumulator, if the engine machine is reversible. In this way, the kinetic energy for braking may be re-transformed and stored in the accumulator.


**Figure 1: Working scheme of the one raided engine**

The generator **(GE)** must perform the following duties: *produce a form of energy which can be easily stored* by the energy accumulator **(AE)** and to be easily transmitted to the engine machine **(MM)**; *work in one raided running*, automatically, based on the principle "all or nothing", meaning to start automatically delivering energy to the accumulator, when the accumulator's energy level is at its minimal allowed limit, and stop automatically when the energy in the accumulator is at its maximum allowed limit. The types of energy which fulfill these conditions are the *hydrostatic energy* and the *pneumatic energy*. The hydrostatic energy may be used for a large range of powers and many domains. The hydrostatic transmissions are well known and considered superior to the other existing transmissions. The pneumatic energy may be used for low powers and usually in limited domains of activity.

The generators which can fulfill the previous stated conditions are generators with free pistons **(fig. 2)**. The generators with free pistons are made of two cylinders, the motor cylinder **(CM)** and the fluidic cylinder **(CF)**, coaxially assembled in the interior of which the free piston **(PL)** can move linear-alternatively, which is the only mobile part of the generator and is not joined with other elements.

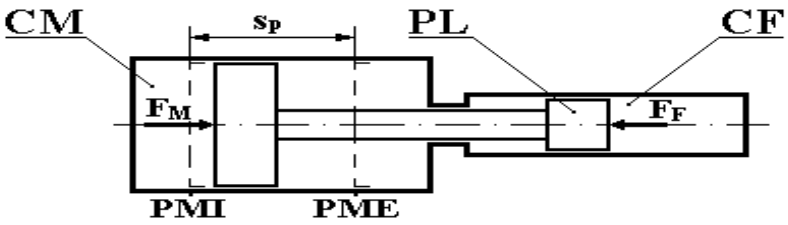


**Figure 2: Generators with free pistons scheme**

The repeated start-stop of the piston at the end of the course doesn't affect the engine machine, because the speed and the kinetic energy of the piston is zero at the end of the course. This phenomenon cannot be realized on machines which have mobile joined elements because of the acceleration-braking moments, when start-stop there is a loss of energy. The movement of the piston is made by the force from the $\mathbf{F_M}$ motor cylinder, called motive force and the force of the fluidic cylinder $\mathbf{F_F}$. the motive force $\mathbf{F_M}$ is realized by the pressure of the burning gases, obtained through the burning of a fuel (gasoline, petroleum). The force from the fluidic cylinder $\mathbf{F_F}$, represents the pressure force of the fluid which generates the energy, which is materialized through a liquid or gas.

## RESULTS AND DISCUSSION

The propulsion systems operated by engines with free pistons, designed according the new concept, have the following advantages: simple design, having the possibility to divide to each working part of a hydraulic or pneumatic engine, in this way the mechanic transmission can be removed; we estimate a more technical and viable system, compared to the present ones; low fuel consumption, because the generator of the engine works one raided only, with the less fuel consumption and doesn't run empty; the possibility of recovering the braking energy of the working parts, because the motor element **(MM)**, is a reversible engine; we estimate the diminishing of the fuel consumption with 50-60% compared to the present systems; the possibility of the diminution of polluting emissions to international standards, without the need of complex electronic devices; the new engines, designed according to the new concept may be used to a large range of mobile propulsion systems, of great work complexity, because the engine element **(MM)** is a reversible machine.

## CONCLUSIONS

It is recommended the re-directing of the research concerning the diminution of polluting emissions and of fuel consumption of the internal combustion engines towards engines which work one raided. In this way, we can realize making less effort and more efficiently, the conditions assigned for the internal combustion engines concerning the diminution of polluting emissions and of fuel consumption.

## REFERENCES

[1] Chioreanu N., 2006, Motoare termice monoregim, Editura Universității din Oradea.
[2] Chioreanu N., Chioreanu S., 2006, Motoare termice neconventionale pentru automobile, Editura Universității din Oradea.
[3] Grunwald B., 1980, Teoria, calculul si constructia motoarelor pentru autovehicule rutiere, Editura Editura Tehnica, Bucuresti.